Data Holding Capacity of ‘n’ Consecutive Upward Spinning Electrons

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Abstract

Quantum computer is a type of computer which uses the quantum state of subatomic particles to store information. It can perform certain kinds of computations more efficiently than a regular computer.

Quantum computing is a type of computation whose operation is associated with the quantum mechanical phenomenon, such as **superposition**, **interference**, and **entanglement**.

Apart from the quantum mechanical computers, we have classical computers which use bits to store information with the use of transistors.
All the data stored in digital bits are in the form of binary notation using only two digits **0** and **1**. For instance 4 bits are enough for representing numbers from **0** to **15** and **8** bits is enough for representing **0** to **255**.

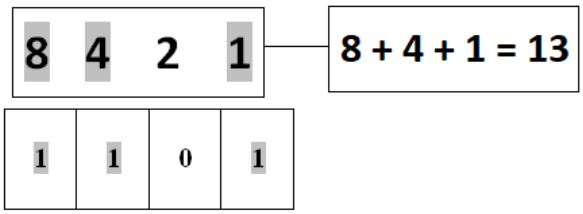

fig. Representing Numbers in 4 bits

Now coming back to quantum computers, they use **Qubits (Quantum Bits)**, based on the spin of an **electron** or the orientation of a **photon**. These systems can be in different arrangements all at once , the property is called **Quantum Superposition** (*showing upward (0) and downward (1) spins at the same time*). When Qubits are linked with each other with the phenomena called **entanglement**.

Each qubit works the same corresponds to a classical **Bit** (**0** for **OFF** and **1** for **ON),** but in case of **Quantum Bit**, the orientation of the **electron** determines whether it is **0** or **1** which is respectively **UPWARD** or **DOWNWARD** spin of that **electron**.

So, for this article we are not going to talk about how it works or ask about if the system is in superposition then how it is going to show a specific spin. Our point is to show how much just **100** electrons with specific spin at its maximum information representation delivers if we put **1** qubit as **1** bit of data.

By these above discussions we are going to see some calculations based on this.

Calculations

Taking **100** cubits or **spinning electrons** we can get a series;

$$\mathbf{1, 2, 4, 8, \ldots\ldots.}\varphi_n$$

Where first term $\varphi_1 = \mathbf{1}$ and last term $\varphi_{n=100}$ or the **100th** term φ_{100} that we will calculate.

With a common ratio $\mu = \mathbf{2,}$ also called **Ahmad's Constant** (ratio of consecutive binary bit to its previous binary bit in the series).

For getting the last or the **100th** term in this case we are going to use the following equation;

$$\varphi_n = \varphi_1 \cdot \mu^{(n-1)}$$

We named the above equation as the **Areeb Ahmad's nth Upward Spin Equation**. Derivation on pg. 3
Using this equation we get;

$$\varphi_{100} = \varphi_1 \cdot \mu^{(100-1)}$$

$$\varphi_{100} = \varphi_1 \cdot \mu^{(99)}$$

$$\varphi_{100} = 1 \cdot 2^{(99)}$$

$$\varphi_{100} = \mathbf{633,825,300,114,114,700,748,351,602,688}$$

Conclusion

Through the above calculation we concluded that just **100** qubits can represent **633,825,300,114,114,700,748,351,602,689 Bits,** that equals to **9903520314.2830429077 Gigabytes.**

So, this was the most basic idea of the capability of a **Quantum Computer**.

Derivation Of Areeb Ahmad's n^{th} Upward Spin Equation

Let we have a series of upward spinning electrons

$$\varphi_1, \varphi_2, \varphi_3, \varphi_4, \varphi_5, \varphi_6.$$

Where ,

$$\frac{\varphi_2}{\varphi_1} = \frac{\varphi_3}{\varphi_2} = \frac{\varphi_4}{\varphi_3} = \frac{\varphi_5}{\varphi_4} = \frac{\varphi_6}{\varphi_5} = \mu \text{ (Say)}$$

Where μ is the **common ratio**. We get,

$$\frac{\varphi_2}{\varphi_1} = \mu \tag{1}$$

$$\varphi_2 = \mu\,(\varphi_1) \tag{2}$$

$$\varphi_3 = \frac{(\varphi_2)^2}{\varphi_1} \tag{3}$$

$$\varphi_3 = \frac{(\varphi_2)^2}{\varphi_1} = \mu\,(\varphi_2) \quad \left[\text{Since, } \frac{\varphi_2}{\varphi_1} = \mu\right] \tag{4}$$

From equation **(4)** we have,

$$\varphi_3 = \frac{(\varphi_2)^2}{\varphi_1} \tag{5}$$

Putting equation **(2)** in equation **(5)**

$$\varphi_3 = \frac{(\mu \varphi_1)^2}{\varphi_1} \tag{6}$$

$$\varphi_3 = \frac{\mu^2 \varphi_1^2}{\varphi_1} \tag{7}$$

$$\varphi_3 = \mu^2 \varphi_1 \tag{8}$$

We know that n = 1, 2, 3, 4, 5….
From equation **(8)** we concluded,

$$\boxed{\varphi_n = \mu^{(n-1)} \varphi_1}$$

Hence we have proved the required equation.